and including a plurality of types of conductor elements that perform different receiving operations, the plurality of conductor elements being arranged spaced away from each other in a direction intersecting an incoming direction of electromagnetic waves, and the plurality of conductor elements being substantially polygonal and having at least one corner portion of an arc shape having a curvature radius corresponding to the resonant frequencies; and

a loss material for causing energy loss to electromagnetic waves, provided close to the element receiving means.

According to the invention, element receiving means is configured by arranging a plurality of conductor elements in the direction intersecting the incoming direction of electromagnetic waves . With this element receiving means, it is possible to efficiently receive electromagnetic waves with the same frequency as the resonant frequencies of the conductor elements. A loss material is provided close to the element receiving means, and causes energy loss to electromagnetic waves that are received by the element receiving means. In other words, the energy of electromagnetic waves can be converted into thermal energy and absorbed. By using the element receiving means in this manner, it is possible to efficiently receive and absorb electromagnetic waves. Furthermore, not one type of conductor elements, but a plurality of types of conductor elements are provided. Thus, it is

possible to efficiently receive and efficiently absorb electromagnetic waves taking advantage of the property of each element. It is possible to improve the absorption efficiency of

elements of the invention.

In this manner, after securing the stability of the conductance, as one means for adjusting the susceptance in this case, the size of the conductor elements that are attached to the back face of the (magnetic) loss material is adjusted and the shape of the conductor elements is selected. More specifically, in order to attain the matching at a lower frequency, the amount of the susceptance increased by increasing the size of the conductor elements is reduced by the conductor elements that are attached to the back face of the (magnetic) loss material. In other words, the conductor elements that are attached to the back face of the (magnetic) loss material play a role to adjust so as to attain the matching at a low frequency by restoring the amount of the susceptance on the circumference with a conductance of 1 increased as the frequency becomes higher. Accordingly, when it is not necessary to control the susceptance, the conductor elements on the back face of the (magnetic) loss material are not always necessary.

Furthermore, by forming corner portions in the shape of arcs, it is possible to improve the absorption efficiency of electromagnetic waves with the same frequency as the corresponding resonant frequencies. Accordingly, it is possible to realize the electromagnetic wave absorber that is thin and has a high absorption efficiency.

Furthermore, in the invention, it is preferable that the

conductor elements are arranged also in the incoming direction of electromagnetic waves, in addition to the direction intersecting the incoming direction of electromagnetic waves.

According to the invention, the conductor elements are arranged also in the incoming direction of electromagnetic waves. Since the conductor elements are arranged three-dimensionally,

According to the invention, the cross conductor elements are arranged such that radially extending portions are faced with each other, and the quadrangular elements are formed in the shape corresponding to the areas surrounded by the cross conductor elements. This arrangement provides an optimum (high) receiving efficiency in the combination of the cross conductor elements and the quadrangular conductor elements. Accordingly, it is possible to realize the electromagnetic wave absorber with a high receiving efficiency.

Furthermore, in the invention, it is preferable that a size of a spacing between the conductor elements is determined so as to lower the resonant frequencies of the conductor elements.

According to the invention, the resonant frequencies of the conductor elements can be shifted toward a lower frequency. Thus, it is possible to absorb electromagnetic waves with a low frequency while keeping the total thickness small. Accordingly, it is possible to make the electromagnetic wave absorber thinner. This is more specific means for obtaining an effect of lowering the resonant frequencies of the conductor elements.

Furthermore, in the invention, it is preferable that a property value of the loss material is determined based on the resonant frequencies of the conductor elements so as to improve the absorption efficiency of electromagnetic waves with the

same frequency as the resonant frequencies.

According to the invention, it is possible to obtain the electromagnetic wave absorber with a high absorption efficiency of electromagnetic waves.

Furthermore, in the invention, it is preferable that the electromagnetic wave absorber is made flame resistant, quasi-incombustibile, or incombustibile.

According to the invention, flame resistance, quasi-incombustibility, or incombustibility can be attained. When the absorber is used in or laminated on an architectural interior material, it is necessary to satisfy at the same time flame resistance, quasi-incombustibility, or incombustibility required for the architectural interior material. With this aspect, the absorber can be preferably used in or laminated on the building interior material. The flame resistance, the

and excellent in the strength and workability while having a high ability to absorb electromagnetic waves. When a pattern is regarded as a receiving element, it is possible to design the absorber having the ability to absorb electromagnetic waves in combination with a different type of material such as a building interior material, and thus the absorber can be easily designed and produced as an interior material and the like.

Furthermore, by forming corner portions in the shape of arcs, it is possible to improve the absorption efficiency of electromagnetic waves with the same frequency as the corresponding resonant frequencies. Accordingly, it is possible to realize the electromagnetic wave absorber that is thin and has a high absorption efficiency.

Furthermore, according to the invention, a novel combination of conductor elements is proposed based on a calculation using the FDTD analysis method. As a result, it is possible to make a (magnetic) loss material layer thinner than that in conventional electromagnetic wave absorbers using patterns, and thus the total thickness of the electromagnetic wave absorber can be further reduced.

Furthermore, according to the invention, it is possible to prevent the resonant frequencies of the conductor elements from being changed by the influence of a location at which the electromagnetic wave absorber is disposed.

Furthermore, according to the invention, it is possible

to increase the conductivity of the conductor elements and to improve the receiving efficiency.

Furthermore, according to the invention, it is possible to stably attain a conductivity of 10,000 S/m or more in the conductor elements.

Furthermore, according to the invention, the thickness

efficiency.

Furthermore, according to the invention, it is possible to lower the resonant frequencies by adjusting the size of the spacings between the conductor elements, and thus the total thickness of the electromagnetic wave absorber can be reduced.

Furthermore, according to the invention, the property values of loss materials are determined so as to improve the absorption efficiency of electromagnetic waves, and thus it is possible to efficiently absorb electromagnetic waves.

Furthermore, according to the invention, the flame resistance, the quasi-incombustibility, or the incombustibility is provided, and thus the absorber can be preferably used in or laminated on a building interior material.

Furthermore, according to the invention, it is possible to absorb electromagnetic waves at a high absorption efficiency using the electromagnetic wave absorber.

Claims

1. An electromagnetic wave absorber, comprising:

element receiving means provided with a plurality of conductor elements having predetermined resonant frequencies and including a plurality of types of conductor elements that perform different receiving operations, the plurality of conductor elements being arranged spaced away from each other in a direction intersecting an incoming direction of electromagnetic waves, and the plurality of conductor elements being substantially polygonal and having at least one corner portion of an arc shape having a curvature radius corresponding to the resonant frequencies; and

a loss material for causing energy loss to electromagnetic waves, provided close to the element receiving means.

2. The electromagnetic wave absorber of claim 1, wherein the conductor elements are arranged also in the incoming direction of electromagnetic waves, in addition to the direction intersecting the incoming direction of electromagnetic waves.

3. The electromagnetic wave absorber of claim 1 or 2, further comprising electromagnetic wave reflecting means for reflecting electromagnetic waves, disposed on a side opposite to a side from which electromagnetic waves income with respect to the element receiving means.

4. The electromagnetic wave absorber of any one of claims 1 to 3, wherein a conductivity of the conductor elements is at least 10,000 S/m.

5. The electromagnetic wave absorber of any one of claims 1 to 4, wherein the conductor elements are made of metal.

6. The electromagnetic wave absorber of any one of claims 1 to 5, wherein the electromagnetic wave absorber is formed in the shape of a sheet having a thickness of at least 0.1 mm and at most 4 mm.

7. The electromagnetic wave absorber of any one of claims 1 to 6, wherein the electromagnetic wave absorber is formed in the shape of a sheet having a mass per unit area of at least 0.2 kg/m^2 and at most 5 kg/m^2.

8. The electromagnetic wave absorber of any one of claims 1 to 7, wherein among the plurality of types of the conductor elements, one type of the conductor elements are cross conductor elements that are formed in the shape of crosses, and another type of the conductor elements are quadrangular conductor elements that are formed in the shape of planes,

the cross conductor elements and the quadrangular

conductor elements are arranged in the direction intersecting the incoming direction of electromagnetic waves,

the cross conductor elements are arranged in a regular manner in the direction intersecting the incoming direction of electromagnetic waves, and

the quadrangular conductor elements are arranged in areas surrounded by the cross conductor elements so as to fill in the areas.

9. The electromagnetic wave absorber of claim 8, wherein the cross conductor elements are arranged such that radially extending portions are faced with each other, and the quadrangular elements are formed in the shape corresponding to the areas surrounded by the cross conductor elements.

10. The electromagnetic wave absorber of any one of claims 1 to 9, wherein a size of a spacing between the conductor elements is determined so as to lower the resonant frequencies of the conductor elements.

11. (Cancelled)

12. (Currently Amended) The electromagnetic wave absorber of any one of claims 1 to 10, wherein a property value of the loss material is determined based on the resonant frequencies of

the conductor elements so as to improve the absorption efficiency of electromagnetic waves with the same frequency as the resonant frequencies.

13. (Currently Amended) The electromagnetic wave absorber of any one of claims 1 to 11, wherein the electromagnetic wave absorber is made flame resistant, quasi-incombustibile, or incombustibile.

14. (Currently Amended) A method for absorbing electromagnetic waves by using the electromagnetic wave absorber of any one of claims 1 to 12.